

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: CPHT
CNRS identification code: UMR 7644
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Internship location: CPHT, Ecole Polytechnique, Palaiseau

Thesis possibility after internship: YES

Funding: NO

If YES, which type of funding:

Effects of quantum fluctuations on holographic dynamics

The goal of this internship is to compute the effects of quantum fluctuations on gravitational dynamics and in strongly-coupled quantum field theories through the use of gauge/gravity duality (aka holography).

Gauge/gravity duality is a first-principle framework which captures the dynamics of strongly-coupled states of matter. It originates from string theory, where it was discovered as a duality with a specific supersymmetric gauge theory. In the limit of infinite rank of the gauge group and large coupling, this gauge theory is dual to Einstein gravity coupled to a number of matter fields, in a higher number of spacetime dimensions. Thus, by solving the gravity equations, we can access the correlation functions of the dual field theory

An important class of black hole spacetimes have a near-horizon geometry which displays an emergent two-dimensional copy of anti de Sitter spacetime (AdS₂) near extremality (at low Hawking temperatures). Their low-temperature dynamics is particularly simple and given by the Schwarzian derivative of the AdS₂ boundary time. This action has been quantized and its correlation functions are known.

In the near-extremal limit, where quantum fluctuations are dominated by this effective action, quantum corrections may be computed. We will address this issue in the various sectors of four-dimensional black holes, building on ongoing work.

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: NO

Quantum Physics: NO

Theoretical Physics: YES